X-ray Scattering Studies of Liquid-Liquid Interfaces

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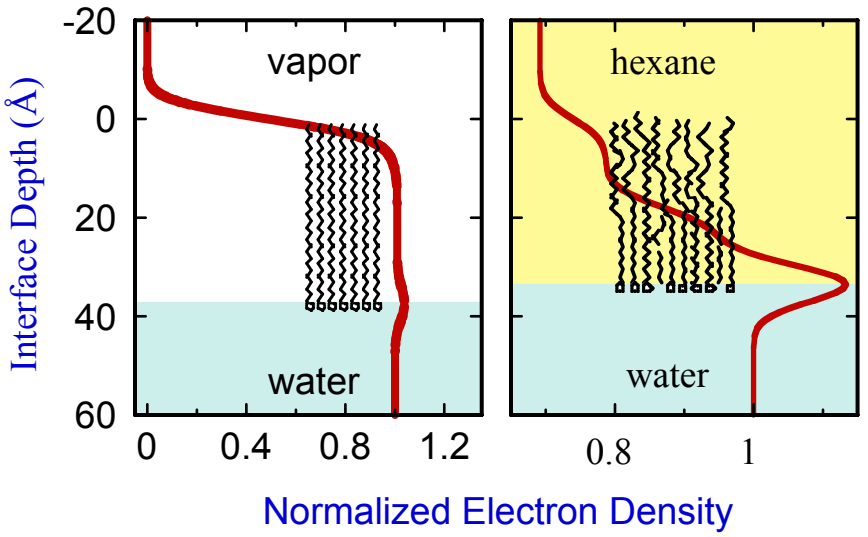
The science and technology of soft materials is important in areas such as food technology, drug delivery, detergents, catalysis of new compounds, and extraction processes in oil or nuclear waste recovery. These materials often contain regions or interfaces where two different liquids interact. Understanding the molecular processes at these interfaces is quite difficult since they are buried within the material. We use synchrotron x-rays to study the molecular ordering at these interfaces. Here we present a study that highlights the different ordering of a long-chain surfactant, triacontanol, at the liquid-vapor and liquid-liquid interfaces.



Profile of electron density along the interface depth for a monolayer of triacontanol molecules at the water-vapor interface (left) and water-hexane interface (right). This illustrates the very different molecular ordering at these two interfaces.

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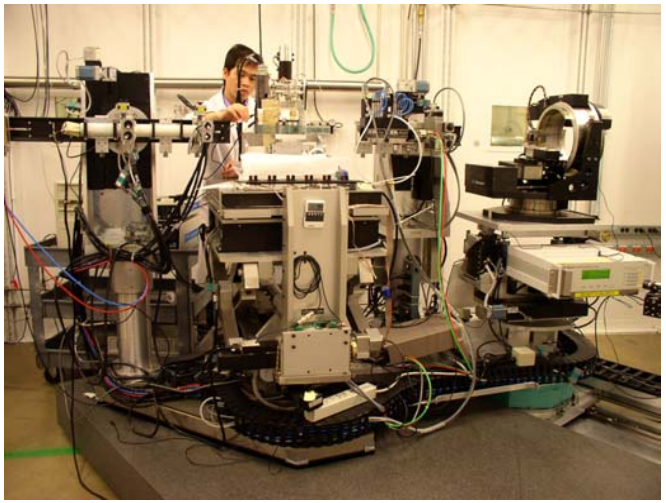
Education:

An undergraduate (Ben Stull), graduate students (Sai Venkatesh Pingali, Sarka Malkova), and postdocs (Guangming Luo, Ming Li, Aleksey Tikhonov) contribute to our research program on liquid-liquid interfaces. Scientists at the National Synchrotron Light Source beamline X19C (Aleksey Tikhonov) and at the ChemMatCARS beamline at the Advanced Photon Source (Binhua Lin, Mati Meron, David Schultz, Jim Viccaro, Jeff Gebhardt, Tim Graber) also contribute to this work and train students. Ming Li is currently a Professor at the Institute of Physics in Beijing, PRC. Ben Stull is attending Rush Medical College in Chicago.

Scientific Infrastructure:

The synchrotron x-ray facilities developed for these experiments at the National Synchrotron Light Source and the Advanced Photon Source are available for use by all qualified scientists.



Guangming Luo setting up a liquid-liquid experiment at the ChemMatCARS liquid surface instrument at the Advanced Photon Source. *Physica B*, **336**, 75 (2003)